

Borehole

21-10-05**Log Event A****Borehole Information**

Farm : <u>BX</u>	Tank : <u>BX-110</u>	Site Number : <u>299-E33-168</u>
N-Coord : <u>45,369</u>	W-Coord : <u>53,519</u>	TOC Elevation : <u>656.51</u>
Water Level, ft :	Date Drilled : <u>9/30/1971</u>	

Casing Record

Type : <u>Steel-welded</u>	Thickness, in. : <u>0.280</u>	ID, in. : <u>6</u>
Top Depth, ft. : <u>0</u>	Bottom Depth, ft. : <u>100</u>	

Borehole Notes:

Borehole 21-10-05 was drilled in September 1971 to a depth of 100 ft. The borehole was completed with 6-in. casing. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel pipe, which was typically used as casing during the early 1970s drilling campaign. Although no information concerning grouting or perforations is provided in the drilling log or in Chamness and Merz (1993), it is assumed that the borehole was not grouted or perforated since this was not a routine practice during the early 1970s drilling campaign. The top of the casing, which is the zero reference for the SGLS, is approximately 0.5 ft below the ground surface. The current measured depth of the borehole was 98.3 ft.

Equipment Information

Logging System : <u>2</u>	Detector Type : <u>HPGe</u>	Detector Efficiency: <u>35.0 %</u>
Calibration Date : <u>04/1997</u>	Calibration Reference : <u>GJO-HAN-13</u>	Logging Procedure : <u>P-GJPO-1783</u>

Log Run Information

Log Run Number : <u>1</u>	Log Run Date : <u>08/04/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>98.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>L</u> Shield : <u>N</u>
Finish Depth, ft. : <u>59.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>2</u>	Log Run Date : <u>08/04/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>60.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>R</u> Shield : <u>N</u>
Finish Depth, ft. : <u>50.0</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

Log Run Number : <u>3</u>	Log Run Date : <u>08/05/1997</u>	Logging Engineer: <u>Bob Spatz</u>
Start Depth, ft.: <u>51.0</u>	Counting Time, sec.: <u>100</u>	L/R : <u>R</u> Shield : <u>N</u>
Finish Depth, ft. : <u>33.5</u>	MSA Interval, ft. : <u>0.5</u>	Log Speed, ft/min.: <u>n/a</u>

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Log Run Number :	<u>4</u>	Log Run Date :	<u>08/05/1997</u>	Logging Engineer:	<u>Bob Spatz</u>
Start Depth, ft.:	<u>34.5</u>	Counting Time, sec.:	<u>100</u>	L/R : <u>L</u>	Shield : <u>N</u>
Finish Depth, ft. :	<u>0.0</u>	MSA Interval, ft. :	<u>0.5</u>	Log Speed, ft/min.:	<u>n/a</u>

Analysis Information

Analyst : H.D. Mac LeanData Processing Reference : MAC-VZCP 1.7.9Analysis Date : 01/12/1998

Analysis Notes :

This borehole was logged by the SGLS in four logging runs. A centralizer was used during all logging runs. Intervals of the first three logging runs employed a 100-second absolute counting time, not adjusted for system dead time (i.e., real time) because the system dead time exceeded 50 percent. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from the pre- or post-survey field verification spectrum that most closely matched the logging run data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra acquired during a particular logging run. There was negligible gain drift during the logging runs; it was not necessary to adjust the established channel-to-energy parameters to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137, Co-60, and U-235 were detected in this borehole log. Cs-137 contamination was detected in two zones within the borehole. The upper zone of Cs-137 contamination is continuous from the ground surface to a depth of 20 ft. Measured concentrations vary from about 0.2 to about 25 pCi/g. The maximum Cs-137 concentration in this interval occurs at 11.5 ft. The deeper zone of Cs-137 contamination extends from 33 ft to the bottom of the borehole. Measured concentrations vary from 5 to about 4,200 pCi/g. However, the maximum Cs-137 concentration could not be determined because the gamma-ray activity within a portion of this interval exceeded the measurement capability of the SGLS system. Extremely high Cs-137 concentrations (above 5,000 pCi/g) are suspected in the interval of very high gamma-ray intensity that extends from about 33 to 47.5 ft. However, because the dead time in this interval is close to 100 percent, a radioassay of the Cs-137 concentrations could not be determined. Very high Cs-137 concentrations (2,000 to 4,000 pCi/g) were recorded in the interval from 48 to 62 ft. Below 62 ft, the Cs-137 concentrations decrease to about 10 pCi/g. At about 76 ft, Cs-137 concentrations increase to about 1,000 pCi/g, then decrease to about 50 pCi/g at 92 ft. Below 92 ft, the measured Cs-137 concentrations decrease to about 5 pCi/g, but a minor peak in the concentration (about 18 pCi/g) occurs at a depth of 97 ft.

Co-60 and U-235 contamination occurs in the interval of very high Cs-137 contamination from 48 to 62 ft. Co-60 contamination occurs at a concentration of 0.4 pCi/g at 53.5 ft and in concentrations that range from 0.15 to 0.8 pCi/g from 62 to 64 ft (at the base of the zone of very high Cs-137 contaminated zone). The U-235 contamination occurs intermittently from 50.5 to 61.5 ft in concentrations that range from 12 to 60 pCi/g and at 78.5 and 80 ft.

The logs of the naturally occurring radionuclides show that the K-40 concentrations increase from a background of about 8 pCi/g above 35 ft to a background of about 15 pCi/g below a depth of 50 ft. The



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concentrations of the naturally occurring radionuclides could not be measured in the interval from 35 to 50 ft because of the excessive dead time. The Th-232 concentrations increase below the zone of extremely high gamma-ray intensity.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Report for tank BX-110.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A separate plot shows the calculated shape factors. The expected shape factor values for various distributions of Cs-137 are indicated on the plots.